

**Table S1.**

Limit of selection to fix antimutators that reduce  $u_{id}$  in each species. Average effect of an antimutator can be approximated by  $st\Delta u_{id}(G_c+G_{nc})$ , with  $s$  being the average reduction in fitness per mutation,  $\Delta u_{id}(G_c+G_{nc})$  being the reduction in indel mutation rate ( $\Delta u_{id}$ ) multiplied by the total size of deleterious targets ( $G_c+G_{nc}$ ), and  $t$  being the time over which the antimutator is associated with the genetic background.  $\% \Delta u_{id}$  indicates the percentage reduction of the current indel mutation rate that must be exceeded for selection to promote fixation of the antimutator, i.e., the point where the strength of selection promoting the antimutator is equal to the power of random genetic drift:  $st\Delta u_{id}(G_c+G_{nc}) = 1/N_e$  ( $1/2N_e$  in diploids).

Organism	$G_c+G_{nc}$ ( $\times 10^7$ sites)	$N_e$ ( $\times 10^6$ )	$u_{id}$ ( $\times 10^{-10}$ ) events /site/gen.)	$s$	$t$	$\Delta u_{id}$ (events per site per gen.)	$\% \Delta u_{id}$
Prokaryotes							
<i>Agrobacterium tumefaciens</i>	0.57	341.52	0.30	0.01	2.00	$2.57 \times 10^{-14}$	0.09%
<i>Bacillus subtilis</i>	0.43	61.19	1.20	0.01	2.00	$1.90 \times 10^{-13}$	0.16%
<i>Escherichia coli</i>	0.46	179.60	0.37	0.01	2.00	$6.05 \times 10^{-14}$	0.16%
<i>Mesoplasma florum</i>	0.08	1.070	23.10	0.01	2.00	$5.84 \times 10^{-11}$	2.53%
<i>Pseudomonas auriginosa</i>	0.67	210.70	0.14	0.01	2.00	$3.54 \times 10^{-14}$	0.25%
<i>Staphylococcus epidermidis</i>	0.26	35.14	1.13	0.01	2.00	$5.47 \times 10^{-13}$	0.48%
<i>Vibrio cholera</i>	0.39	478.26	0.18	0.01	2.00	$2.68 \times 10^{-14}$	0.15%
Eukaryotes							
<i>Arabidopsis thaliana</i>	5.55	0.29	11.20	0.01	2.00	$1.55 \times 10^{-12}$	0.14%
<i>Caenorhabditis elegans</i>	6.37	0.54	6.69	0.01	2.00	$7.27 \times 10^{-13}$	0.11%
<i>Chlamydomonas reinhardtii</i>	5.51	43.31	0.44	0.01	2.00	$1.05 \times 10^{-14}$	0.02%
<i>Drosophila melanogaster</i>	8.86	0.86	4.61	0.01	2.00	$3.28 \times 10^{-13}$	0.07%
<i>Homo sapiens</i>	21.75	0.02	18.20	0.01	2.00	$5.75 \times 10^{-12}$	0.32%
<i>Mus musculus</i>	27.17	1.77	3.10	0.01	2.00	$5.20 \times 10^{-14}$	0.02%
<i>Paramecium tetraurelia</i>	7.28	101.80	0.04	0.01	2.00	$3.37 \times 10^{-15}$	0.09%
<i>Saccharomyces cerevisiae</i>	1.02	7.78	0.92	0.01	2.00	$3.15 \times 10^{-13}$	0.34%